Landsat 7

Wide Band Recorder

Operations and Maintenance Manual

April 25, 1996

GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

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Preface

This manual contains operations and maintenance information for the Landsat 7 Wide Band Recorder (WBR). The Landsat 7 WBR is a special system developed by NASA/GSFC for the Landsat 7 Project and it's contractors for recording and supplying ETM+ instrument test data to support ground system testing. This document will be continually updated to reflect the latest configuration of theWBR. Direct comments and questions regarding this document to:

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Acronym List

Section 1 — Introduction

1.1 Purpose and Scope of Manual

This manual contains installation, operation, and maintenance information for the Landsat 7 Wide Band Recorder (WBR) units. Described in this manual are the physical and functional characteristics, installation procedures, theory of operation, and maintenance procedures.

1.2 Wide Band Recorder (WBR) Description

The Landsat 7 WBR is a high rate data recorder intended for use as a test and development tool to support the Landsat 7 project. There are two WBRs, S/N 001 and S/N 002. Both units are identical. The WBRs are used to receive and store test data for evaluation. They can also function as a test data source to transmit test data.

The WBRs are designed to record data at continuous data rates up to approximately 85 Mbits/second. The transmit rate is nominally 30 Mbits/sec. They receive and transmit serial ECL NRZ-L data and clock. The WBRs utilize Redundant Array of Inexpensive Devices (RAID) technology for data storage. The 16 GByte Ciprico RAID disk array storage capacity on both units will allow the capture (data receipt and transfer to disk) of over 28 minutes of continuous data at the Landsat 7 data rate (75 Mbits/second). Two SGI Digital Linear Tape Drives (DLTs) are included with the WBRs for long term data storage. An SGI Challenge L Network Resource Server is the system controller. Operator interface is via an SGI Indy workstation that is shared between the two WBR units.

1.3 Equipment Supplied

Each WBR consists of a 19" cabinet and a workstation as shown in Figure 1-1. The workstation is shared by both WBRs. The cabinet contains:

1. Silicon Graphics Incorporated (SGI) Challenge L Network Resource Server, Model CMN A011, consisting of:
    A. CPU Board (contains two R4400 200 mhz processors)
    B. RAM Board (128 MByte)
    C. Input/Output I/O 4 Board #1 (for RAID SCSI)

D. Input/Output I/O 4 Board #2 (with VCAM Board).
E. 2 GB System Disk
F. CD ROM
G. 4mm DAT

2. Ciprico Inc. 6700 Disk Array, Model AR 6702.

3. Two Silicon Graphics Incorporated (SGI) P-S-DLT Digital Linear Tape Drives.

4. Silicon Graphics Incorporated (SGI) INDY R4600PC workstation.

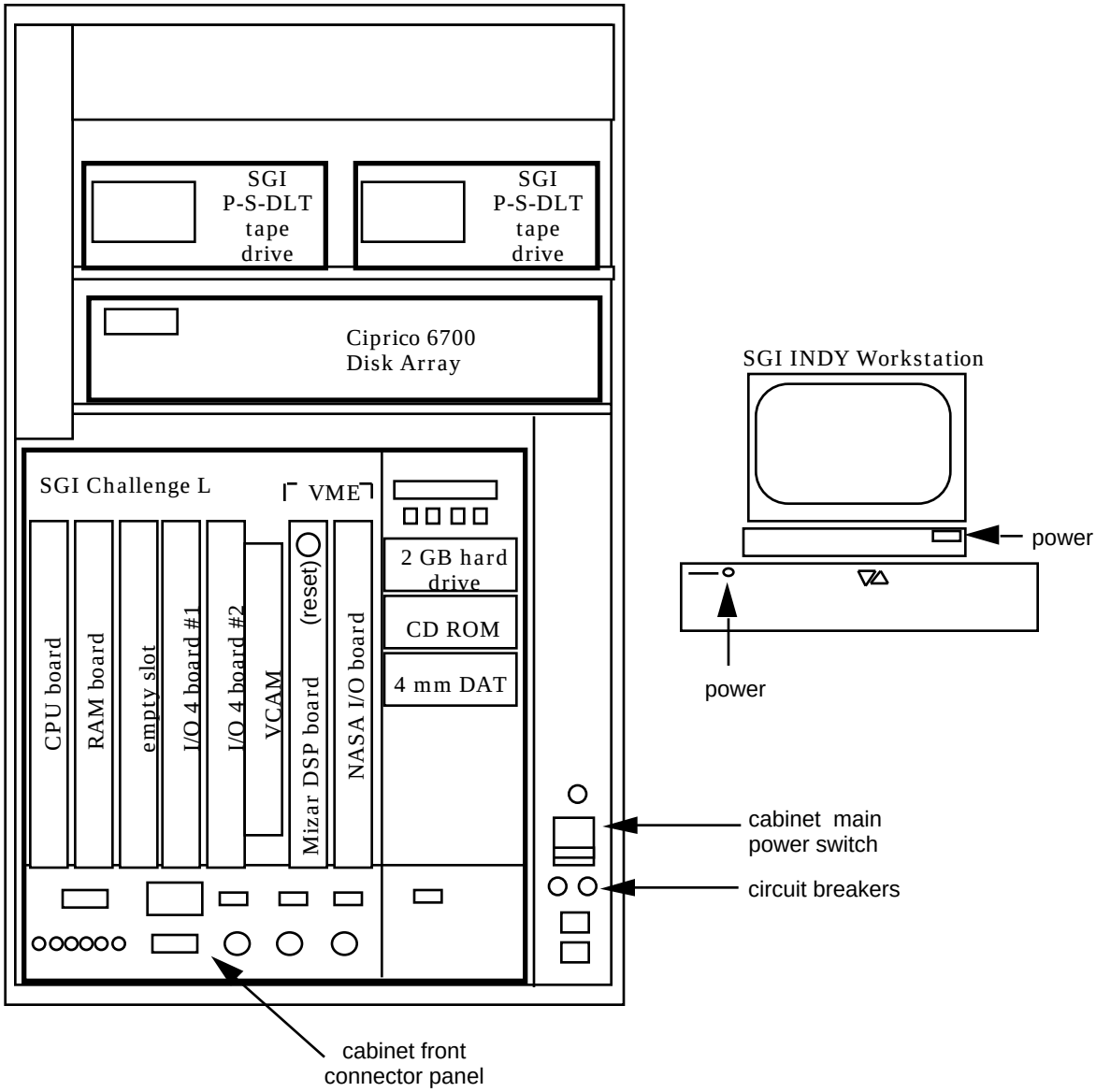


Figure 1-1: Location of WBR Components
(front view)

Each SGI Challenge L has an internal VME backplane. The VCAM board provides the interface between the SGI backplane and the VME backplane. Two boards are installed in the VME chassis of each Challenge L:

1. MIZAR Inc., MZ 7772 Digital Signal Processor (DSP) Board.

2. NASA Input/Output (I/O) Board, S/N 001 (WBR S/N 001)
   NASA Input/Output (I/O) Board, S/N 002 (WBR S/N 002).

The rear view of the WBR cabinet and workstation are shown in Figure 1-2. The locations for the power connections to the individual components are indicated.

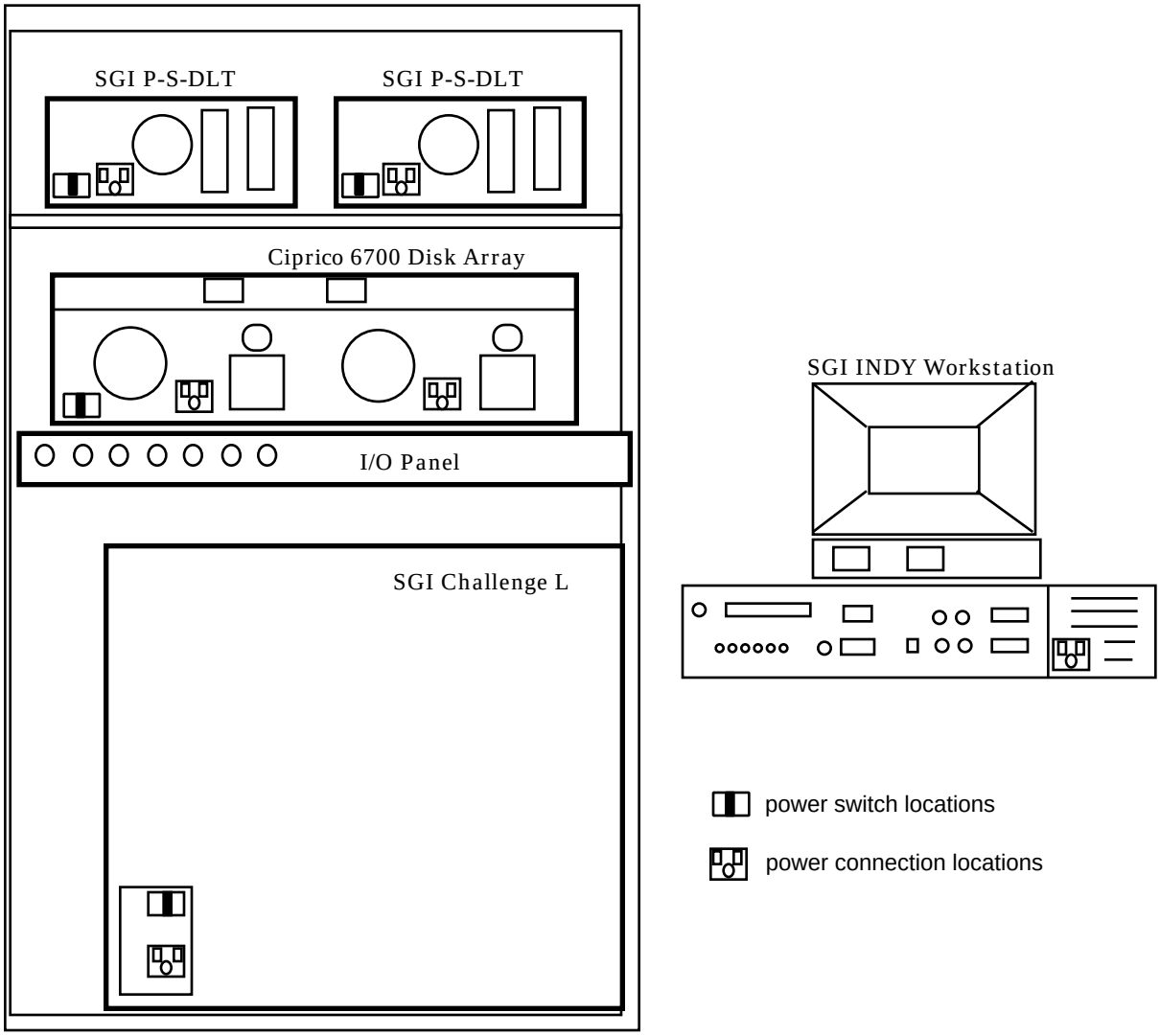


Figure 1-2: Location of WBR Components
(rear view)

1.4 Related Publications

1. Addendum to the Disk Array Guide, Ciprico Inc., Publication Number 21020650 A, March, 1994

2. AD6700 Integrated Disk Array Quick Installation Guide, Ciprico Inc., Publication Number 21020270 A, August 1993.

3. Challenge/Onyx Site Preparation Guide, Silicon Graphics Incorporated, Document Number, 108-7040-020, 1993.

4. Digital Linear Tape Drive Owner's Guide, Silicon Graphics Incorporated, Document Number 007-2266-001, 1994.

5. Indy Workstation Owner's Guide, Silicon Graphics Incorporated, Document Number, 007-9804-030, 8/94.

6. IRIS InSight Library "Deckside Power Challenge and Challenge L Owner's Guide". This on-line documentation is available on the SGI Challenge L system drive. See sections 6.2.1 or 6.3.1 of this document for instructions to access the library.

7. MZ 7770 Digital Signal Processor Board Hardware Reference Manual, Mizar Inc., Number 4425554, Second Edition, Sept. 1993.

8. Product Note for 6700/10 Disk Arrays and Controller Boards, Ciprico Inc., Publication Number 21020295 H, April 1995.

Section 2 — Installation

2.1 General

The following subsections provide information on unpacking, space requirements, floor loading, cooling, power, cabling, software installation, and equipment adjustments. For additional information on operating temperatures, sound levels, vibration, etc. refer to the documentation listed in Section 1.4.

2.2 Unpacking and Inspection

To unpack, position the equipment in a manner convenient for performing the installation. Remove any packing material and perform a thorough inspection. Check the packing container for external damage before removing the contents. Use care in handling and removing the packing material and the components.

2.3 Space Requirements

The WBR cabinet is 60.5" high x 27.75" wide x 38.5" deep. During normal operations, the cabinet can be located adjacent to other equipment. Recommended clearances during maintenance or repair activities that require cabinet access are shown in figure 2-1. Casters and levelers are provided on the bottom of the WBR cabinet.

The SGI Indy workstation chassis requires a 3.25" high x 16.25" wide x 14" deep space. The display requires a 16.5" high x 15.5" wide x 17.5" deep space. The keyboard needs a 28.0" wide x 8.5" deep space including the mouse. A table top surface (not supplied) is required for the workstation, keyboard, and mouse.

2.4 Floor Loading

The WBR cabinet requires 150 lb/sq. ft. floor loading capacity.

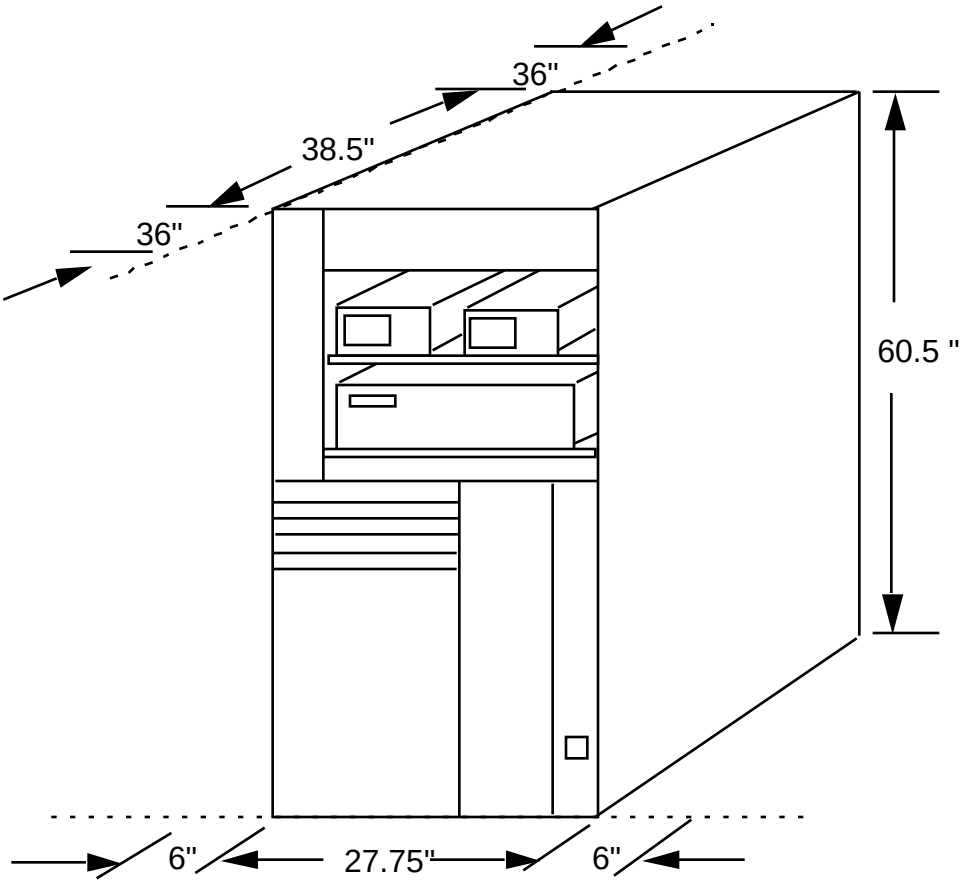


Figure 2-1: WBR Cabinet Recommended Clearances

2.5 Cooling Requirements

The cooling requirements for the WBR are listed in Table 2-1. The SGI Challenge L fan pulls in air from the bottom of it's enclosure, exhaust is at the top of it's enclosure. Allow 5 inches minimum airflow clearance.

Cooling	Btu/hour
Challenge L (Server & graphics, 120V 1-phase) Monitor DLT(each unit) RAID	6,500 512 ---- 1,020
	AC load (ton)
Challenge L (Server & graphics, 120V 1-phase) Monitor DLT(each unit) RAID	0.54 0.04 ---- 0.09

Table 2-1: Cooling Requirements

2.6 Power

The power requirements are listed in Table 2-2:

Power	Amps (each unit)
Challenge L (120 VAC,1-phase, 3 wire, 1500 W)	16
DLT (120 VAC, 50 W) RAID (120 VAC)	1 6
Workstation chassis (120 VAC) display (120 VAC)	4.2 2.7

Table 2-2: Power Requirements

2.7 Cabling

The system interconnection cable diagram for the LAN and console cables is shown in Figure 2-2. The TTY console serial cables are AT&T 1024 002ABE type with DB9 connectors. The Ethernet cable is RJ11 type with RJ45 connectors.

The BNC cable connections for the ECL serial data and clock signals are located on the cabinet rear I/O panel as shown in Figure 2-3. Use RG-223 cable (50 ft maximum length) with UG-88 BNC connectors (or equivalent).

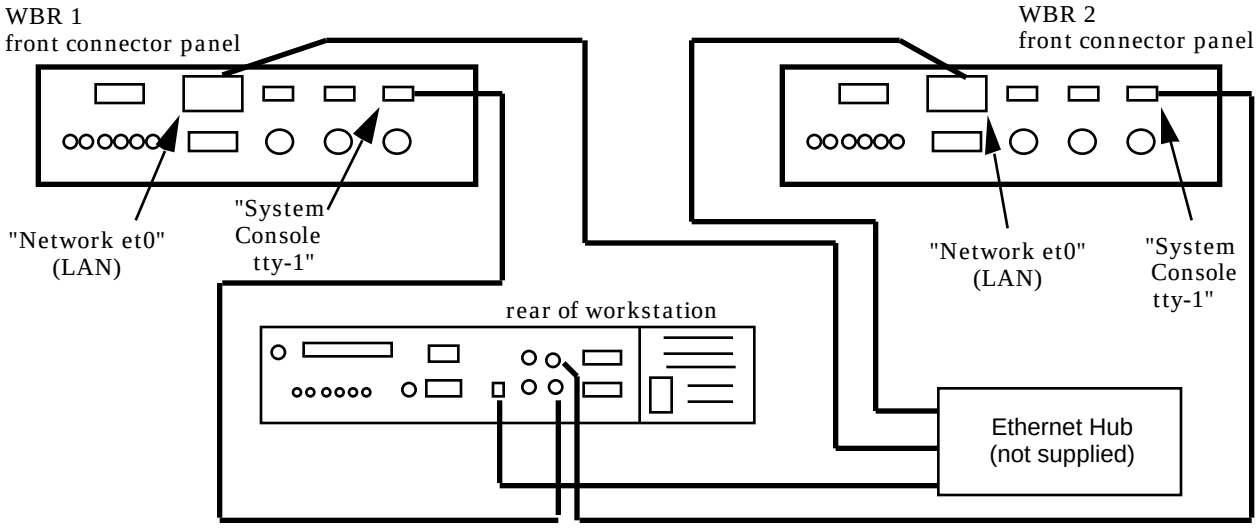


Figure 2-2: System Interconnection Cable Connection Diagram

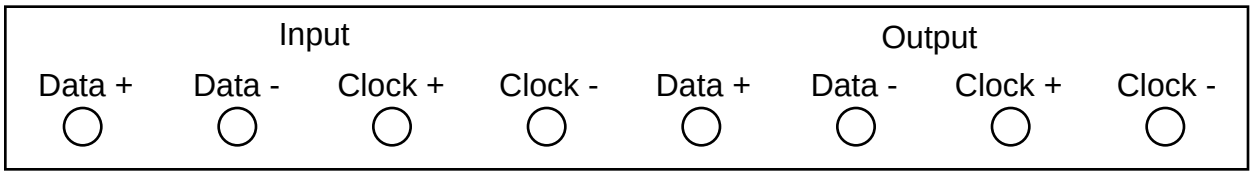


Figure 2-3: I/O Panel Serial Data and Clock Connections

2.8 Software Installation

The WBR units are delivered with all software installed. Two 4mm cassettes labeled "Recorder1" and "Recorder2" contain backup copies of the software on the system disks of each WBR.

2.9 Equipment Adjustments

Equipment adjustments are not required.

Section 3 — Operation

3.1 Turnon

Turn on the Indy workstation via the power switches located on the Indy chassis and the video display as indicated in Figure 1-1. There are two Indy power switches, one each for the chassis and display.

Verify that the power switches on the DLTs, RAIDs, and Challenge L units **are turned off**. See Figure 1-2 for power switch locations. Turn on each of the WBR cabinet main power switches located on the front of each WBR cabinet as shown in Figure 1-1. Power is now applied to all of the WBR components.

Turn on the power switches on the DLTs, RAIDs, and Challenge L units.

3.2 Startup and Log In

When the login window appears on the INDY , at the prompt for the name enter "landsat" <CR>. Enter password "landsat" <CR>.

Establish two windows (one each for WBR 1 and 2) using the Desktop Menu at the top left of the screen. Use the mouse to scroll down the menu and select "Unix Shell". Click the left mouse button and the window will appear. Repeat for second window.

In either window, connect to the desired WBR Challenge using the console utility (cu). Enter the command: "cu -l ttyd1(or 2)" <CR>. Note that using this console utility will result in all system messages being displayed in the window. The message "Connected" will appear. Enter <CR>. The Indy is now connected to the selected Challenge L.

Place the key in the Challenge L front panel key switch and turn the key switch clockwise to the 12 o'clock position. This will initiate the Challenge L startup (boot) sequence. Allow approximately 2 minutes for this to complete. Messages will appear in each console window as each system boots up. This is normal.

At the prompt "lpsdsl1(1 for WBR1 or 2 for WBR2) login:" enter "landsat" <CR> for both the login and password. At the message TERM=(vt100) enter <CR>. Type "wbr" alias to get to the directory: /usr/people/mizar /mz7772d. This directory contains the executable

files. The prompt "lpsrec1 n#" (n is a integer that increments everytime the <CR> is hit) will appear. You are now ready to record or transmit data.

NOTE: When the ethernet network has been established it is recommended that each recorder be operated using the rec1 and rec2 commands instead of the cu command. This will result in a telnet session in each window and will eliminate any unwanted system messages corrupting any text on the screen.

3.3 Record

The command line syntax to initiate data recording is: "./mzuser -R1 -D/ -P80 -F"<CR>.

Where:	R1	=	CPU 1 (not selectable).
	D	=	Directory where the files will reside **MUST** be /usr/data or any directory below that.
	P80	=	File size = 80 x 1 MB, selectable values between 20 and 16000.
	F	=	Filename that will collect the data (optional). If filename is not specified, the file will be labeled by the date, start time, and stop time.

Once this command has been entered, the WBR will store to the RAID any data that it receives. A typical command would be "./mzuser -R1 -D/usr/data -P80 <CR>. The data will be stored in the /usr/data directory with a file name similar to "Feb22,1996_15:57:23_15:58:02" . An alias has been created for this command called "rec80". This command will record 80 MBytes of data. For larger file sizes use the ./mzuser command described above.

3.4 Stop Recording

Once the WBR has started to record data, it will continue to record until the file size specified in the record command (-P) has been reached. At this time, the WBR will automatically terminate. A sample display will be:

lpsrec1 3% rec80
Opening device /dev/mz7772A.....opened

```
mzuser version: 2/22/96 v1.0
mzimbed firmware date: 2/20/96 v1.0
mzuser: React is on
mzuser: User process running on processor [ 1 ]
./mzuser processing 8 segments of size 10485760
Press "q" followed by the <enter> key to abort.
.....      (each dot represents 10 MB of data received)
Data collected to file </usr/data/Feb22,1996_15:57:23_15:58:02>
Total Time:              19.613472 seconds
Total Data transferred:     671088640 bits
Transfer Rate:           34215700 bits/sec
lpsrec1 4%
```

NOTE: The longer the capture session the more accurate the statistics will be. The rate is not 100% accurate.

If it is desired to terminate the recording process anytime prior to the end of the file, enter "q"<CR>. The system will then instruct you to go over to the appropriate recorder and **GENTLY** press the green mizar reset button on the front panel of the SGI Challenge L computer. Finally, press any key and the system will exit gracefully.

A sample display is shown:

```
lpsrec1 6%
lpsrec1 6% rec80                                (alias to start recording)
Opening device /dev/mz7772A.....opened
mzuser version: 2/22/96 v1.0
mzimbed firmware date: 2/20/96 v1.0
mzuser: React is on
mzuser: User process running on processor [ 1 ]
./mzuser processing 8 segments of size 10485760
Press "q" followed by the <enter> key to abort.
q                                       (operator entry "q" <CR>)

RESET the Mizar board by pressing the green button now,
then press the <enter> key.

The system is terminating. Please wait.

./mzuser terminated after 4 segments

Data collected to file </usr/data/Feb22,1996_16:00:34_16:01:03>
Total Time:              8.747359 seconds
Total Data transferred:     335544320 bits
Transfer Rate:           38359500 bits/sec
lpsrec1 7%
```

NOTE: This procedure will stop the recording gracefully even if there is no data coming into the recorder. Failure to follow the above procedure may result in the system halting and data loss. NEVER use CTRL C, CTRL Y, or CTRL BACKSPACE to exit record or play back functions.

3.5 Display the Data

Once recording is complete type "cd /usr/data"<CR> or type the alias "data" <CR> to change to the data directory. The Unix command "pwd" will display the current directory, if needed. The command "ls -la"<CR> will display a long listing of the directory files.

For large files, it is recommended to use the od (octal dump) utility to display the data. Type "od -h filename |pg <cr>". The editor VI cannot display large files. Check man pages for details. Type "man od"<cr>

An example of a typical od command to look at file "test1" is: "od -h test1 |pg" <CR>. The "odit" <CR> command performs an od -h on the most recently recorded file located in the /usr/data directory. It runs from directory "/usr/people/mizar/mz7772d". Remember that you must get back to the mz7772d directory to operate the recorder. Type "wbr <CR>" anytime to get back to this directory. To get out of the odit utility prior to completion type CTRL backspace. **Never** use this to exit record or playback functions.

3.6 Store and Retrieve Data Files

To load a cassette in a DLT drive, follow the instructions printed on the front of the DLT drive. The DLT drives are connected to the Challenge L SCSI Controller 40, units 6 and 7 within each cabinet. Refer to front of the DLT units for the correct unit #

To transfer a data file from the RAID to the DLT, at the prompt type: "tar cvf /dev/mt/tps40d6vc /usr/data/filename"<CR>, where 40 = the SCSI controller number and 6 = the unit number.

If the file resides in directory "/usr/data", this command will work. Otherwise, if the file resides in a different directory, the proper path must be specified before the filename.

To display a list of files that are contained on a DLT cassette type : "tar tvf /dev/mt/tps40d6vc. Specify the correct unit (6 or 7).

To load a file from a DLT tape to the RAID type: "tar xvf /dev/mt/tps40d6vc path/filename"<CR>, where path is the directory where the file will end up.
Specify the correct unit (6 or 7).

3.7 Transmit (Playback)

To transmit (playback) data from a WBR type: "./mzuser -R1 -D/usr/data/pbfiles
-P (size) -W(name of file)"<CR> while in the /usr/people/mizar /mz7772d directory. The playback files used during testing of these systems are located in the /usr/data/pbfiles directory. Type "pb <CR>" (an alias) to get to the directory.
Type "ls -la" to see what is in the directory. Remember to return to the mz7772d directory by typing "wbr <cr>" before attempting to use the record or playback function.

On line help can be displayed by typing "./mzuser -h"<CR> as shown below:

Usage is: ./mzuser -Rn -D<dir> -P<meg> -W<fn> -F<fn>

where R means REACT where n = processor #
D specifies the directory of the capture file
where <dir> is the directory name
P specifies the pass size in Megabytes
where <meg> is the value of pass size in meg
W means to run mzuser in output mode
where <fn> is the file name of the source file
F overrides the system generated filename with
the name specified by <fn> (**for capture mode only**)

An example of a playback session using the file 0tof as a source is:

lpsrec2 21# ./mzuser -R1 -D/usr/data/pbfiles -P130 -W0tof
(or type the alias "0tof"<CR>)
Opening device /dev/mz7772A.....opened
mzuser version: 2/22/96 v1.0
mzimbed firmware date: 2/20/96 v1.0
mzuser: React is on
mzuser: User process running on processor [1]
./mzuser operation in PLAYBACK mode: /usr/data/pbfiles/0tof
./mzuser processing 10 segments of size 10485760
Press "q" followed by the <enter> key to abort.
.....

End of file reached. All data was transferred. *(In this case the source file was only 100 MBytes so the playback ended prior to the requested 130 Mbyte playback length)*

Total Time: 19.573072 seconds
Total Data transferred: 503316480 bits
Transfer Rate: 25714740 bits/sec
lpsrec1 6%

3.8 Stop Transmit

To quit during transmit (playback), type "q"<CR> during session and follow the directions that are printed on the screen.

Example:

lpsrec1 7% 0tof (using the alias "0tof")

Opening device /dev/mz7772A.....opened
mzuser version: 2/22/96 v1.0
mzimbed firmware date: 2/20/96 v1.0
mzuser: React is on
mzuser: User process running on processor [1]
./mzuser operation in PLAYBACK mode: /usr/data/pbfiles/0tof
./mzuser processing 10 segments of size 10485760
Press "q" followed by the <enter> key to abort.
....q

RESET the Mizar board by pressing the green button now, then press the <enter> key.
(*The flow of data will now stop)*

The system is terminating. Please wait.

./mzuser terminated after 3 segments

Total Time: 6.311300 seconds
Total Data transferred: 251658240 bits
Transfer Rate: 39874232 bits/sec
lpsrec1 8%

3.9 Shutdown

To shutdown the WBR, the user must be ROOT. If ROOT, then type "halt"<CR>. Wait until maintenance menu appears:

System Maintenance Menu

1) Start System
2) Install System Software
3) Run Diagnostics
4) Recover System
5) Enter Command Monitor

Option?

Turn the key switch on the front of the Challenge L counterclockwise to the Off position. Turn off all the other devices using the power switches located on the back of the individual units and turn off the cabinet main power switch on the front bottom right of the cabinet.

If the user is not ROOT, turn the key switch on the front of the Challenge L counterclockwise to the Off position. Turn off all the other devices using the power switches located on the back of the individual units and turn off the cabinet main power switch on the front bottom right of the cabinet. This will not hurt the system but will take slightly longer to boot up.

Section 4 — Hardware Description

4.1 Configuration

The block level hardware configuration for each WBR is shown in Figure 4-1. Each WBR consists of an SGI Challenge L Network Resource Server, one Ciprico (RAID) disk array, two SGI Digital Linear Tape Drives, and a SGI Indy workstation. The VME chassis internal to the SGI Challenge L contains a NASA custom designed Input/Output (I/O) board and a Mizar MZ 7772 DSP board.

4.2 SGI Challenge L

The SGI Challenge servers are multi-processor systems designed for distributed computing environments. Their parallel architecture is based on a 1.2 GByte per second sustained bus (E-bus). Each WBR Challenge L supports two 200 Mhz R4400 CPUs which are installed on a single board. The CPU board also has 4 Mbytes of secondary cache. The memory subsystem has one RAM board providing 128 Mbytes of memory with 4 way interleaving.

As depicted in Figure 4-1, the two I/O 4 boards contain the SCSI II, Ethernet, and FDDI controllers along with serial and parallel ports. The WBR does not use the FDDI controller or the parallel ports. Also included on I/O 4 board #2 is a VCAM module which provides the controller for the VME/64 backplane which is internal to the Challenge L cabinet.

The VME chassis contains a COTS Mizar MZ 7772 DSP board and a custom NASA I/O board. Both of these boards are described further on in this section.

SCSI devices include a CD-ROM, 4mm DAT, and a 2 GByte system disk.

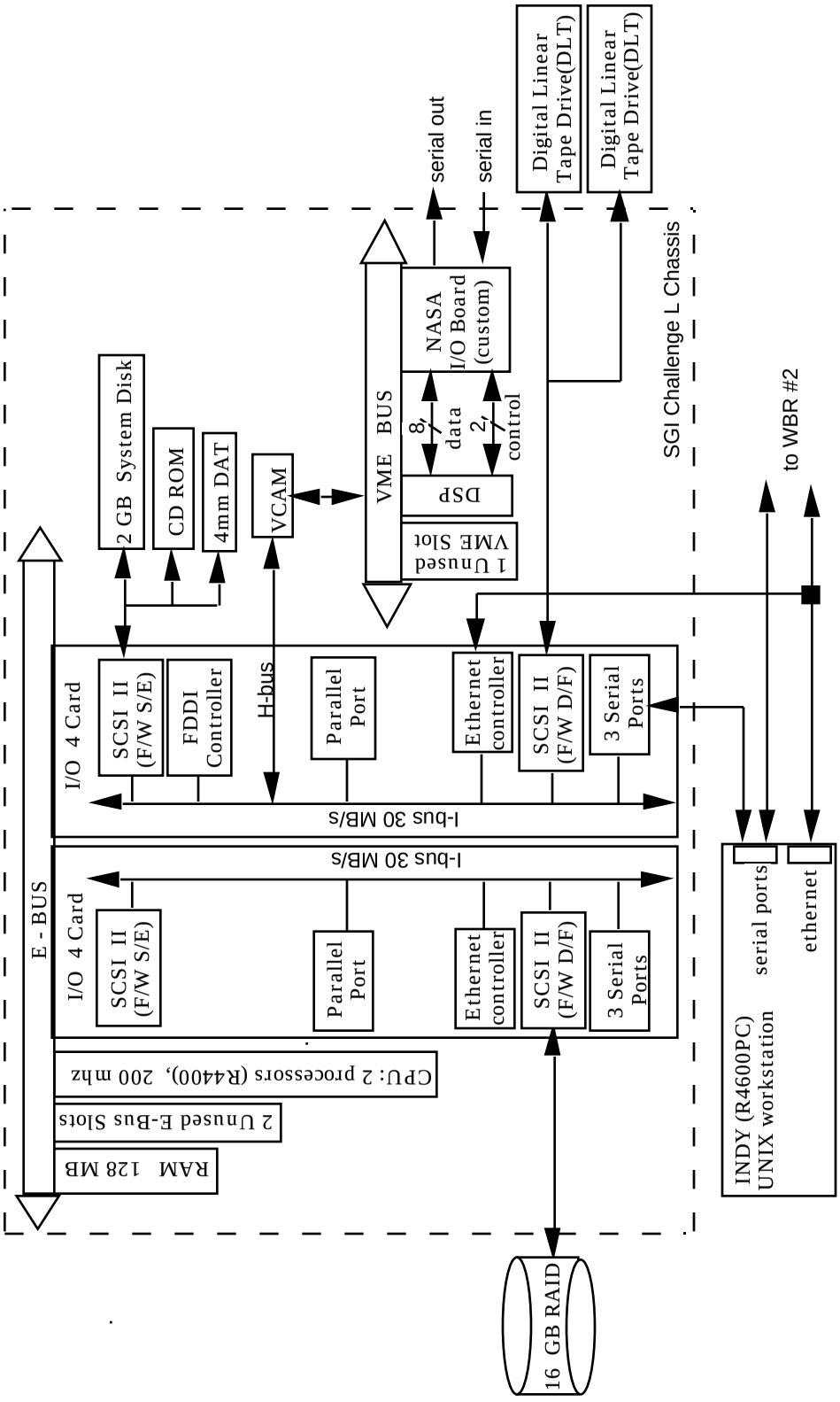


Figure 4-1: WBR Architecture Hardware Block Diagram

4.3 Ciprico Disk Array

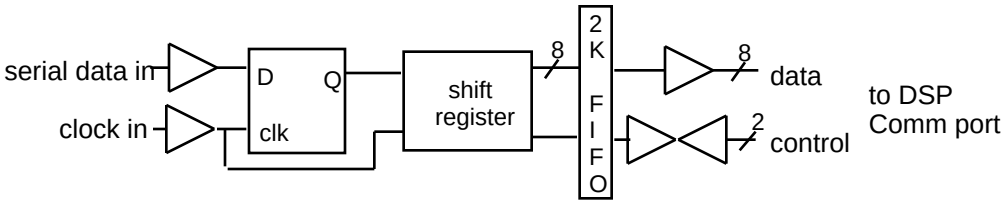
The Ciprico Inc. 6700 Disk Array Subsystem, referred to as a Redundant Array of Inexpensive Devices (RAID), is included with each WBR. The disk array is connected to the SGI Challenge L via a Small Computer Systems Interface (SCSI-2 differential fast/wide) controller. The disk array contains eight 3.5" data drives in parallel along with a ninth (parity) drive providing over 16 GBytes (formatted) of data storage. The 16 GByte storage capacity will allow the capture (data receipt and transfer to disk) of over 28 minutes of continuous data at the Landsat 7 data rate (75 Mbits/second). The Disk Array Subsystem contains redundant power supplies.

4.4 Digital Linear Tape Drive

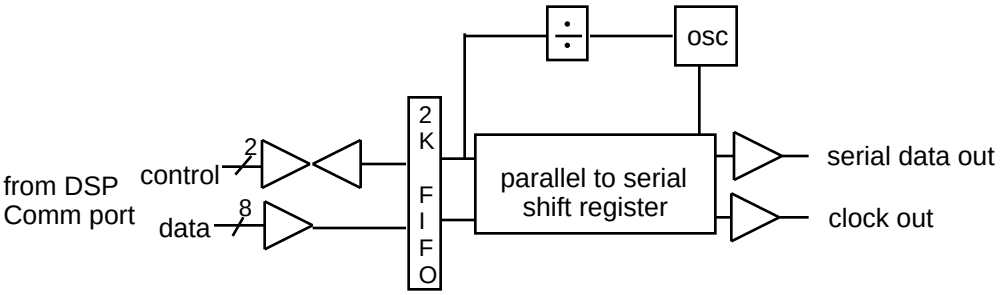
The SGI P-S-DLT digital linear tape drive is a SCSI 0.5 inch cartridge tape drive. It features a capacity of 10 Gbytes native and 20 Gbytes compressed. and a sustained user data rate of 1.23 Mbytes/second native and 2.5 Mbytes/second compressed. A Landsat 14 minute contact (7.9 Gbytes) can be stored on one DLT cassette.

4.5 NASA Input/Output (I/O) Board

A custom designed I/O board is installed in the SGI Challenge VME backplane. The block diagram is shown in Figure 4-2. During receive, the NRZ-L ECL serial data is reclocked and converted to 8 bit bytes for parallel transfer to the Mizar DSP board via a DSP communications port. The I/O board can also receive 8 bit parallel data from a DSP board communication port and transmit serially as NRZ-L ECL data and clock.



RECEIVE DATA BLOCK DIAGRAM



TRANSMIT DATA BLOCK DIAGRAM

Figure 4-2: NASA Input/Output Board Block Diagrams

4.6 Mizar DSP Board

The MIZAR Inc. MZ 7772 DSP circuit board consists of four Texas Instruments TMS 320C40 50 Mhz digital signal processors. It is installed in the SGI VME chassis. The block diagram is shown in Figure 4-3. The DSP board provides the interface between the I/O board and the VME bus. Data from the I/O board is received by a DSP communication port and transferred to the SGI system RAM via the VME bus interface on the DSP board. Alternately, the DSP board receives data from the SGI via the VME bus and transfers it to the I/O board.

4.7 Peripherals

Peripherals include one SGI Indy R4600PC workstation which is connected to both of the WBRs via Ethernet LAN. This Indy workstation is provided for operator interface.

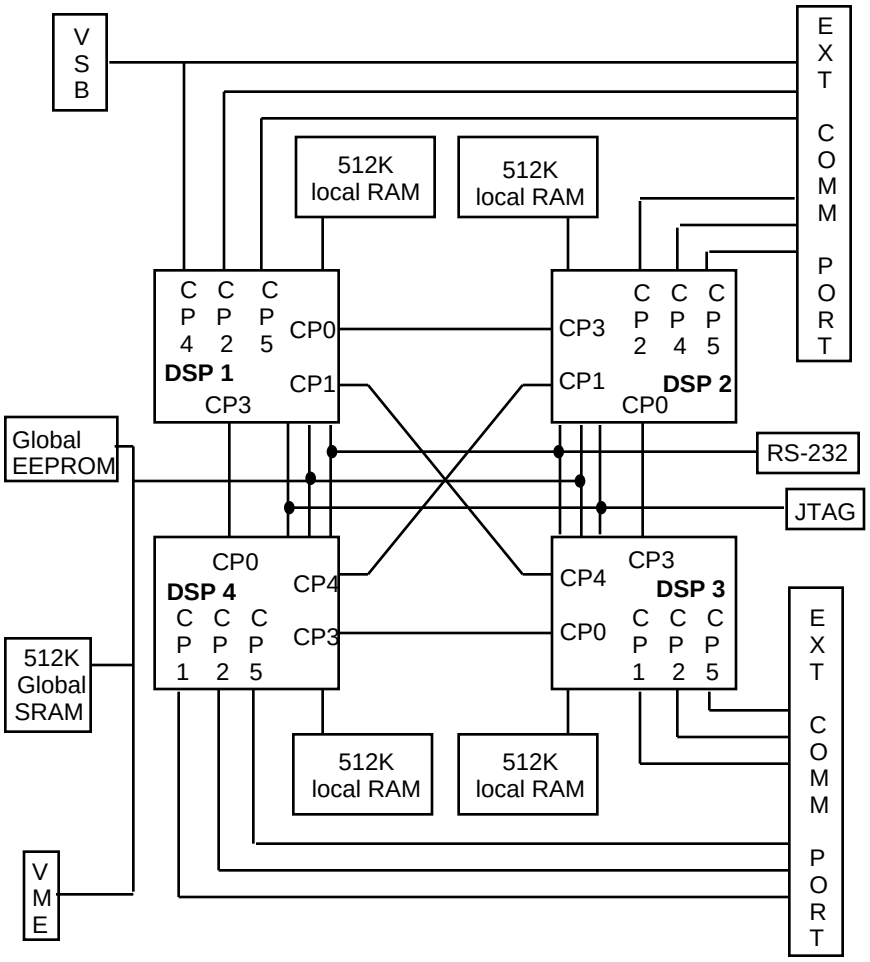


Figure 4-3: DSP board Block Diagram

4.8 Hardware Functional Description

A Record Data Signal Flow Diagram is shown in Figure 4-4. Serial ECL data and clock are received by the WBR I/O board. The I/O board is designed to receive serial data at rates up to 85 Mbits/second. The rate of parallel transfer to the communication port of the DSP board from the I/O board is one eighth of the serial data rate since the transfer is byte wide. The DSP board communication port is rated for a maximum throughput 160 Mbits/second.

Data received by the DSP board communication port is stored in DSP global on-board SRAM (see Figure 4-3) prior to transfer across the VME bus. The DSP performs global bus transfers across the VME bus to support the incoming data rate.

The received data is then moved into SGI system RAM. From SGI system RAM, where the data is memory mapped to a file, it is transferred to the data capture RAID. The SCSI/2 peak transfer rate to the disk array is 20 MBytes per second. Since data is simultaneously being written and read from SGI system RAM, the system will need the bandwidth to support this data flow. The system E-Bus peak transfer rate is specified as 1.2 GBytes per second.

Once the recording of data is completed, the data can be stored on DLT. The DLT Data Store Signal Flow Diagram is shown in Figure 4-5. The DLT has a maximum transfer rate of 20 Mbits/second and can store up to 20 GBytes (compressed) of data per cartridge.

The serial out data transmission signal flow is the inverse of Figure 4-4 and similarly the playback of data from the DLT to the RAID is the inverse of Figure 4-5.

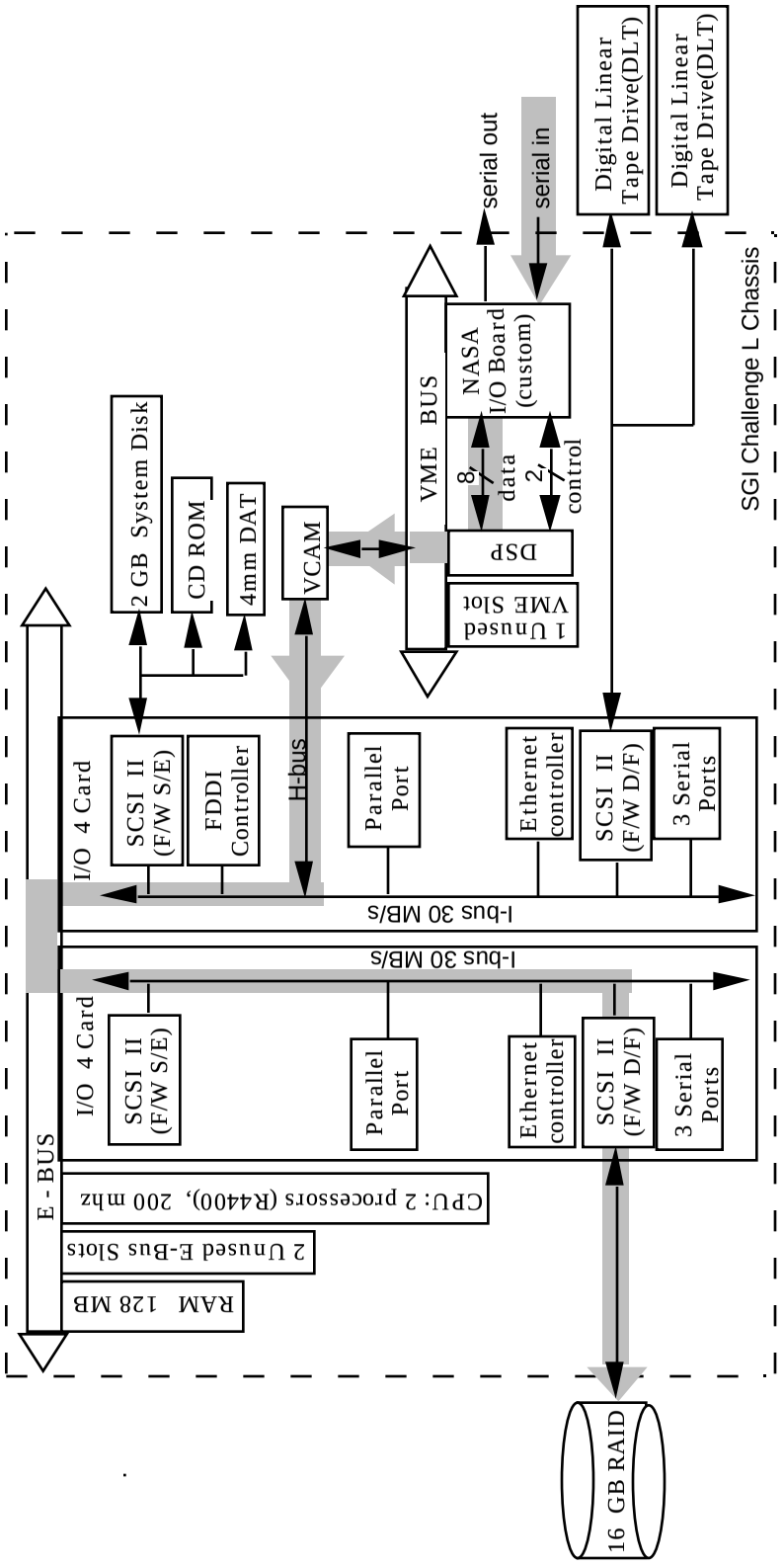


Figure 4-4: Record Data Signal Flow Diagram

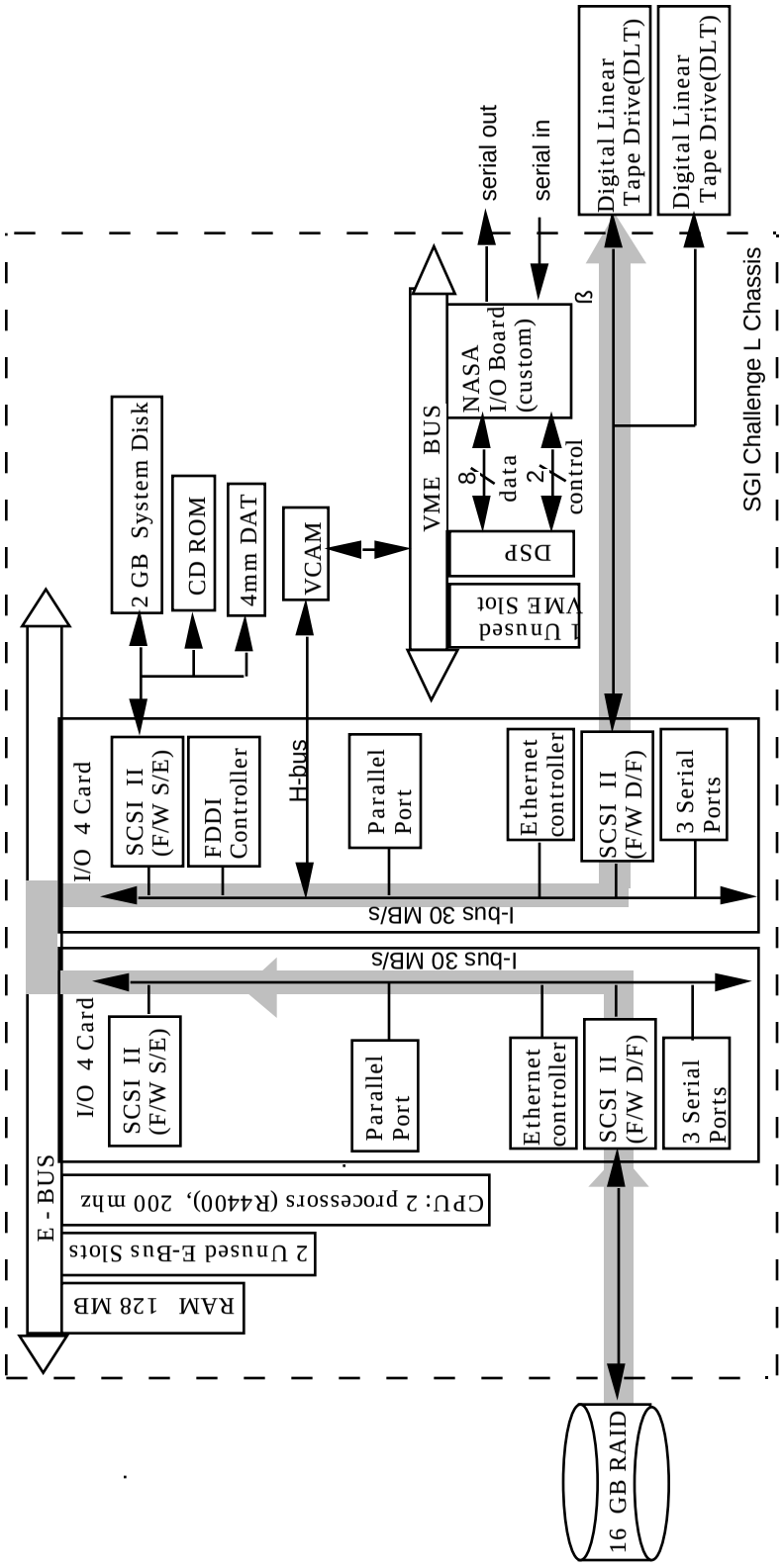


Figure 4-5: DLT Data Store Signal Flow Diagram

Section 5— Tools

5.1 Introduction

This section describes the software tools that are included with the WBR. These files are useful for generating and checking test data.

5.2 Rec (Recirculating Pattern Checker)

This tool checks for a recirculating data pattern within a file. An example of use is given below. Enter ./rec <filename> <CR>, followed by prompt for pattern size and the data pattern.

l7xlsrv 115# ./rec 01234567 4 *(checks file 01234567 4)*
PATTERN SIZE: 4
PATTERN: 1 23 45 67
total 10485760 byte segments: 10. total bytes lost: 0
l7xlsrv 116#

File must reside in /usr/data.

5.3 Datagen (Repeating Data Pattern File Generator)

This tool creates large repeating pattern files. Usage is ./datagen <filename> <length in Mbytes>.

Pattern will always =

dead 0001 89ab cdef 0123 4567 89ab cdef
0123 4567 89ab cdef 0123 4567 89ab cdef
*
dead 0002 89ab cdef 0123 4567 89ab cdef
0123 4567 89ab cdef 0123 4567 89ab cdef
*
dead 0003 89ab cdef 0123 4567 89ab cdef
0123 4567 89ab cdef 0123 4567 89ab cdef

where there is 10 MBytes of 0-F 0-F between each dead xxxx header.

xxxx increments to a value based on the total size of the file.

5.4 Pat10M (10 MB File Generator)

This tool generates a fixed 10MByte size file. Usage is: /pat10M <fn> <len> [V] where:

<fn> is the filename created
<len> is the length in 10MB chunks
[V] means to verify the file<CR>.

An example is:

l7xlsrv 165# ./pat10M ron_2 10.

The pattern is:

0000000 1029 3847 5665 7483 9201 1aa1 2bb2 3cc3
0000020 dead 0000 0000 0000 0000 0000 0000 0000
0000040 0000 0008 0000 0009 0000 000a 0000 000b
0000060 0000 000c 0000 000d 0000 000e 0000 000f
0000100 0000 0010 0000 0011 0000 0012 0000 0013
0000120 0000 0014 0000 0015 0000 0016 0000 0017
0000140 0000 0018 0000 0019 0000 001a 0000 001b
0000160 0000 001c 0000 001d 0000 001e 0000 001f

etc...

Header 1029 3847 5665 7483 9201 1aa1 2bb2 3cc3 only appears at the beginning of the file.

Section 6 — Maintenance

6.1 Introduction

This section provides preventative and corrective maintenance information for the WBR. The information includes instructions for cleaning, troubleshooting, and repairing WBR components.

6.2 Preventative Maintenance

6.2.1 SGI Challenge L

Preventative maintenance information is available on the Challenge L system drive and may be viewed using the on-line IRIS InSight Library. After login, type "insight" <CR>. Select the "Deckside Power Challenge and Challenge L Owner's Guide". Appendix B contains instructions for cleaning and maintaining drives.

6.2.2 Ciprico Disk Array

Refer to the Ciprico 6700 Disk Array Guide Chapter 6 for instructions on:

1. Cleaning the air filter.
2. Verifying cooling fan operation.
3. Verifying power supply fan operation.

6.2.3 SGI Digital Linear Tape Drive

Refer to Chapter 5 of the SGI Digital Linear Tape Drive Owner's Guide for cleaning and maintenance information.

6.2.4 SGI Indy Workstation

The workstation does not require routine maintenance since drives are not provided with the workstation. Power-on self tests are run

automatically. Follow the "Hardware and Software Do's and Don'ts" described in Chapter 9, "Safety, Maintenance and Regulatory Information" of the "Indy Workstation Owner's Guide".

6.3 Corrective Maintenance

6.3.1 SGI L

On-line troubleshooting information is available on the Challenge L system drive and may be viewed using the IRIS InSight Library. After login, type "insight" <CR>. Select the "Deckside Power Challenge and Challenge L Owner's Guide". Chapter 5, "Having Trouble", can be used to diagnose system faults. Chapter 4 contains information on installing peripherals.

6.3.2 Ciprico Disk Array

Refer to the Ciprico 6700 Disk Array Guide and Addendum, Chapters 4 and 5 for instructions on:

1. Drive failures and rebuild.
2. Replacing a failed power supply.

Failures are reported through the display panel and the audio alarm (if enabled).

The display panel operation is described in Chapter 3 of the Ciprico 6700/10 Disk Array Guide and Addendum. A built in self test is performed on powerup. The self test codes are described in Chapter 3 (Troubleshooting) of the AD6700 Integrated Disk Array Quick installation Guide.

6.3.3 SGI Digital Linear Tape Drive

Refer to Chapter 5 of the SGI Digital Linear Tape Drive Owner's Guide for troubleshooting information and possible solutions to potential problems.

6.3.4 SGI Indy Workstation

Refer to the "Indy Workstation Owner's Guide". Chapter 7 "Troubleshooting" provides information on installing and removing hardware and software components. Other information is included that is useful for diagnosing problems and identifying faults.

Acronym List

BTU	British thermal unit
<CR>	carriage return
CD ROM	compact disk read only memory
COTS	commercial off the shelve
CPU	central processing unit
DAT	digital audio tape
DLT	digital linear tape (drive)
DSP	digital signal processor
EEPROM	electrically erasable programmable read only memory
ECL	emitter coupled logic
FDDI	fiber distributed data interface
FIFO	first in first out
GSFC	Goddard Space Flight Center
I/O	input/output
Mhz	megahertz
MO&DSD	Mission Operations and Data Systems Directorate
NASA	National Aeronautics and Space Administration
NRZ-L	non-return to zero-level
RAID	Redundant Array of Inexpensive Devices
RAM	random access memory
S/N	serial number
SCSI	small computer serial interface
SGI	Silicon Graphics Incorporated
SRAM	static random access memory
TTY	teletype
VAC	volts alternating current
VME	Versa Module European
W	watt
WBR	Wide Band Recorder